REMARKS

Reconsideration and withdrawal of the rejections of the application are respectfully requested in view of the remarks, amendments, and enclosures herewith. This Amendment is supplemental to the October 17, 2005 Amendment.

I. STATUS OF THE CLAIMS

Claims 1-3, 9-15 and 30-41 are now pending. Claim 1 has been amended, and new claims 39-41 have been added, without prejudice, without admission, without surrender of subject matter, and without any intention of creating any estoppel as to equivalents.

No new matter is added.

It is submitted that the claims, as originally presented and as herein presented, are patentably distinct over the prior art cited by the Examiner, and that these claims are in full compliance with the requirements of 35 USC 112. The new claims, as presented herein, are not submitted for the purpose of patentability within the meaning of 35 USC sections 101, 102, 103 or 112. Rather, these new claims are submitted simply for clarification and to round out the scope of protection to which Applicants are entitled. Support for the new claims can be found throughout the specification, including at page 17, lines 3-4, and at page 18, lines 9-17.

II. THE REJECTIONS UNDER 35 U.S.C. §112 ARE OVERCOME

Claims 1-4, 6-7, 9-15, 30-32 and 34-36 were rejected under 35 U.S.C. §112, first paragraph, as allegedly subject matter which was not described in the specification in such a way as to reasonably convey that Applicants were in possession of the invention at the time of filing.

Claims 1-4, 6-7, 9-15, 30-32 and 34-36 were rejected under 35 U.S.C. §112, first paragraph, as allegedly lacking enablement for any hexose oxidase and any substrate other than *Chondrus cripus* hexose oxidase of SEQ ID NO: 2 and those substrates specifically identified in the specification. The rejection is respectfully traversed.

Applicants again respectfully request that the Examiner review the specification on page 7, lines 3 to 8, for the teaching of a number of suitable enzymes other than hexose oxidase. Each listed enzyme is described as an **oxidase**. Applicants again request that the Examiner review the definition of oxidase as defined in Biochemistry (Matthews, C.K. and Van Holde, K.E., The Benjamin/Cummings Publishing Co., Inc., 1990) on page 532 (copy attached), "[t]he term

oxidase is applied to enzymes that catalyze the oxidation of a substrate by O_2 without incorporation of oxygen into the product." Accordingly, each of the enzymes identified in the specification on page 7, lines 3 to 8, catalyzes reactions using O_2 as a substrate, and the ability of the enzymes to catalyze such a reaction necessitates a structural relationship or similarity between the various enzymes.

The textbook Biochemistry, from which the definition of oxidase above was provided, was published in 1990 – earlier than the filing date of the present application. If one of skill in the art was aware in 1990 that oxidases possess similar characteristics and catalyze the same type of reactions, one of skill in the art at the time the present application was filed would certainly be aware that it would be possible to utilize other oxidases in place of one another.

Furthermore, one of skill in the art at the time the present application was filed would clearly also know how to obtain such oxidases, such that *Chondrus cripus* was not the only possible source for such oxidases. For example, the page of Biochemistry discussed above also states that as of 1990, there were over 200 known enzymes that use O_2 as the substrate, a large number of which can be considered oxidases. If such a large number of enzymes were known in 1990, it follows that their sources were also known, and that such enzymes would be readily obtainable by one of skill in the art.

Therefore, the specification is clearly enabled for a second enzyme that is an oxidase, as required by currently amended claim 1, and the Applicant clearly had possession of this subject matter at the time of filing the present application. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. §112 is respectfully requested.

III. THE REJECTIONS UNDER 35 U.S.C. §103 ARE OVERCOME

Claims 1-4, 6-7, 9-15 and 30-37 were rejected under 35 U.S.C. §103 as allegedly being unpatentable over Hamade *et al.* in view of Hansen *et al.*, and in view of the "known fact in the art that glucose can be obtained by the action of amyloglucosidase on starch".

Additionally, claims 1-4, 6-7, 9-15, 30-32 and 34-36 were rejected under 35 U.S.C. §103 as allegedly being unpatentable over Hamade *et al.* in view of Stougaard *et al.* and in view of the "known fact in the art that glucose can be obtained by the action of amyloglucosidase on starch".

Applicants respectfully traverse the rejections and will address them collectively.

Applicants respectfully assert that the Hamade reference used in repeatedly rejecting the case has been repeatedly misunderstood, and that Hamade does not anticipate or render obvious the present invention, either alone or in any combination.

For example, in speaking to the alleged teachings of Hamade, the Office Action states, "In addition, they teach that the substrate of said oxidase can be produced within the composition by a second enzyme action on a precursor substrate such as the action of cellulase, chitonase, and lysothyme on chitosan to produce glucose, see page 5, lines 50-54." Office Action at page 8.

As discussed in the October 6, 2005 telephonic interview, for which Examiner Nashed, his SPE, and Practice Specialist Eyler are thanked for the courtesies extended therein, attached is an extract from Food Polysaccharides which shows the structure of chitosan and clearly states (see page 442) that chitosan contains glucosamine units and N-acetylglucosamine units, i.e. NO glucose units are present. Also attached are portions of the Sigma Aldrich website, showing that all enzymes mentioned by the Examiner act by hydrolyzing various 1,4-Beta linkages, such that, if reacted with chitosan, would NOT provide glucose units.

As we believe we have shown during prosecution heretofore, and as we will gladly further show by reference to the attached documents, *inter alia*, the quoted statement above is just plain incorrect; chitosan does NOT degrade to give glucose. Therefore, it is respectfully submitted that the application has been erroneously repeatedly rejected on the basis of Hamade.

During the October 6, 2005 telephonic interview, it was suggested that the disclosure at page 3, lines 40-41, in Hamade *et al.* suggests compositions such as those claimed in the present invention. Applicants respectfully disagree. It is respectfully submitted that the skilled artisan would actually understand the disclosure in Hamade *et al.* at page 3, lines 40-41, to be referring to the situation where a naturally occurring enzymatic or chemical reaction spontaneously runs as a second reaction. Spontaneous second reactions such as this are well known in systems using enzymes. For example, hexose oxidase can react with certain substrates to form gluconodeltalactone. In water, this gluconodeltalactone spontaneously undergoes hydrolysis to gluconic acid. An alternative example is observed following the addition of ascorbic acid to dough: this ascorbic acid is transformed to dehydroascorbic acid by ascorbate oxidase present in flour. Furthermore, it is noted that despite discussing a very wide range of possible substrates and enzymes, Hamade *et al.* does not provide a single disclosure of a system using more than one enzyme. Thus, it is respectfully submitted that while Hamade *et al.* does provide a

suggestion that a substrate may go through more than one step to produce an antimicrobial compound, Hamade does not disclose or suggest any compositions comprising more than one enzyme.

Furthermore, the present invention requires the presence of a first substrate (which is selected from oligomers and polymers of substrates for oxidative enzymes) that reacts with a first enzyme to form a second substrate selected from the group consisting of D-glucose, D-galactose, maltose, lactose and cellobiose. Thus, the first substrate must be an oligomer or polymer of substrates for oxidative enzymes comprising at least one of the required structural units of the second substrate. Therefore, the invention requires that the first enzyme reacts with the oligomer or polymer first substrate to produce a second substrate on which the second enzyme is active. In contrast, the only disclosure of an enzyme being active on a polymeric species in Hamade *et al.* relates to the action of a chitosan-decomposing enzyme on citosan to produce a compound having antimicrobial activity as a direct decomposition product of chitosan (see EP0866103, claim 13). Such a system actually teaches away from carrying out a second reaction with a second enzyme on the product formed from the reaction of the polymeric species with a first enzyme.

It is also noted that Hamade *et al.* provides a wide list of non-limiting possible enzyme-substrate combinations which can generate a large number of different antimicrobial agents. No directions are given that would lead a skilled person to select a particular combination over any other combination that is mentioned in the specification. For example, when referring to the production of hydrogen peroxide as the antimicrobial agent, we note that Hamade provides a wash list of enzyme-substrate combinations, see page 5, lines 14-44, (EP0866103). Furthermore, Hamade *et al.* also provides details of the particular types of reactions which can produce hydrogen peroxide, see page 5, lines 26-44. This appears to cover all of the possibilities envisaged by the inventors, as there is no disclosure or suggestion of using a first substrate which reacts with a first enzyme to form a second substrate which reacts with hexose oxidase as required by the present invention. Instead, this passage of Hamade *et al.* continually reiterates that a single enzyme reacts with a single substrate to form the desired antimicrobial agent, hydrogen peroxide.

In relation to the antimicrobial compound, Hamade *et al.* also states,

> Therefore, even when this compound is highly soluble, unstable, or hard to handle, the inherent antimicrobial activity of the compound can be fully exploited. For example, it is by now possible to previously convert a highly water-soluble compound to an insoluble compound, ..., then incorporate the resulting compound in a matrix beforehand, and cause the objective compound to be produced by an enzymatic reaction.
> EP0866103, page 6, line 19-24.

Thus, a key feature for the practical application of the invention of Hamade *et al.* is that the substrate is insoluble whereas the antimicrobial compound is soluble. This feature prevents the substrate from leaching out of the paint into the water. The importance of this feature can be readily seen from the actual examples of Hamade *et al.* Thus, the substrates tributyrin (Example 1), cholesterol (Example 2 and 3) and tricaprin (Example 4) are all insoluble in water (see attached product information sheets). However, it would be readily apparent to the skilled person that many of the suggested enzyme-substrate combinations do not contain this feature. For example, glucose is water soluble, thus the combination of hexose oxidase-glucose mentioned in Hamade *et al.* would not actually provide a solution to the problem of controlled release. Thus, we submit that such combinations would be discounted by the skilled person as not being capable of solving the problem of controlled release of the antimicrobial compound.

In addition, while Hamade *et al.* mention the problem of achieving controlled release of the compound having antimicrobial activity, they suggest that this problem is solved merely by dispersing the enzyme and the substrate in a matrix (see EP 0866103, page 6, lines 3-12). In particular, Hamade *et al.* states:

> In the present invention, the penetration of water into the matrix occurs gradually and sustainedly so that the compound having antimicrobial activity is produced persistently at a controlled rate, thus achieving controlled release of this compound.
> (EP0866103, page 6, line 10-12).

Hamade *et al.* go on to state that the problem of controlled release can be easily reduced to practice through the use of a coating composition of the invention. This coating composition "comprises a film-forming resin, an enzyme, and a substate, said enzyme being capable of reacting with said substrate to produce a compound having antimicrobial activity." (EP0866103, page 6, line 25-30).

Thus, these statements discussed above, as made in Hamade *et al.*, teach away from the present invention as they suggest that a composition comprising an enzyme, a substrate and a

film-forming resin is sufficient to overcome the problem of controlled release of the antimicrobial agent. There is no suggestion in these disclosures of using a composition according to the present invention. Nor, given the disclosure in Hamade *et al.* would the skilled artisan have any motivation or expectation of success to adapt the teachings of this document to produce the present invention.

Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. §103 is respectfully requested.

REQUEST FOR INTERVIEW

If any issue remains as an impediment to allowance, a further interview with the Examiner and his supervisor is respectfully requested, prior to issuance of any paper other than a Notice of Allowance; and, the Examiner is respectfully requested to contact the undersigned to arrange a mutually convenient time and manner for such an interview.

CONCLUSION

In view of the amendment and remarks herewith, the application is in condition for allowance. Favorable reconsideration of the application and prompt issuance of a Notice of Allowance, or an interview at a very early date with a view to placing the application in condition for allowance, are earnestly solicited. The undersigned looks forward to hearing favorably from the Examiner at an early date.

Respectfully submitted,

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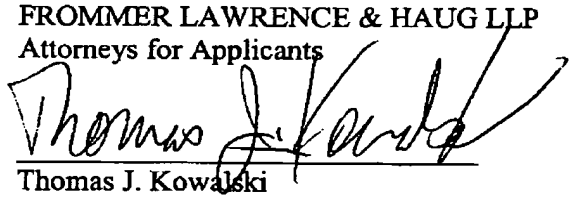
By: 

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